



InterLab[®] Final Report on JOYA+ A Handheld device with Bluetooth

Report Reference: MDE_DATA1_1102_FCCb

acc. Title 47 CFR chapter I part 15 subpart B

Date: September 01, 2011

Test Laboratory:

7Layers AG
Borsigstr. 11
40880 Ratingen
Germany



Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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USt-IdNr • VAT No.:
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1 Administrative Data

1.1 Project Data

Project Responsible: Carsten Steinröder
Date Of Test Report: 2011/09/01
Date of first test: 2011/02/03
Date of last test: 2011/02/18

1.2 Applicant Data

Company Name: Datalogic Mobile s.r.l.
Street: Via S. Vitalino, 13
City: Lippo di Calderara di Reno
40012 Bologna
Contact Person: Mr. Davide E. Vaccaneo
Function: Supervisor
Department: Regulatory & Reliability
Phone: +39 051 314 72 16
Fax: +39 051 314 75 61
E-Mail: davide.vaccaneo@datalogic.com

1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

7 layers DE

Company Name : 7 layers AG
Street : Borsigstrasse 11
City : 40880 Ratingen
Country : Germany
Contact Person : Mr. Michael Albert
Phone : +49 2102 749 201
Fax : +49 2102 749 444
E Mail : michael.albert@7Layers.de

Laboratory Details

<i>Lab ID</i>	<i>Identification</i>	<i>Responsible</i>	<i>Accreditation Info</i>
Lab 1	Conducted Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAkKS-Registration no. D-PL-12140-01-01
Lab 2	Radiated Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAkKS-Registration no. D-PL-12140-01-01

1.4 Signature of the Testing Responsible



Carsten Steinröder
responsible for tests performed in: Lab 1, Lab 2



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40880 Ratingen, Germany
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1.5 Signature of the Accreditation Responsible



Accreditation scope responsible person MACHULEC
responsible for Lab 1, Lab 2

2 Test Object Data

2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: JOYA+ A
Handheld device with Bluetooth

<i>Product Category:</i>	Handheld Device
<i>Manufacturer:</i>	
<i>Company Name:</i>	please see applicant
<i>Contact Person:</i>	please see applicant

Parameter List:

<i>Parameter name</i>	<i>Value</i>
Parameter for Scope FCC_v2:	
AC Power Supply	120 (V)

2.2 Detailed Description of OUT Samples

Sample : a01

<i>OUT Identifier</i>	JOYA+ A		
<i>Sample Description</i>	Handheld device with Bluetooth		
	Sample with int.Antenna		
<i>HW Status</i>	1.0		
<i>SW Status</i>	1.40		
<i>Date of Receipt</i>	2011/01/25		
<i>Low Voltage</i>	3.4 V	<i>Low Temp.</i>	0 °C
<i>High Voltage</i>	4.2 V	<i>High Temp.</i>	50 °C
<i>Nominal Voltage</i>	3.7 V	<i>Normal Temp.</i>	20 °C

Sample : b01

<i>OUT Identifier</i>	JOYA+ A
<i>Sample Description</i>	Handheld device with Bluetooth
	Sample with temp.ant.connector
<i>HW Status</i>	1.0
<i>SW Status</i>	1.40
<i>Date of Receipt</i>	2011/01/25

Sample : c01

<i>OUT Identifier</i>	JOYA+ A
<i>Sample Description</i>	Handheld device with Bluetooth
	Sample with temp.ant.connector
<i>HW Status</i>	1.0
<i>SW Status</i>	1.40
<i>Date of Receipt</i>	2011/01/25

2.3 OUT Features

Features for OUT: JOYA+ A Handheld device with Bluetooth

<i>Designation</i>	<i>Description</i>	<i>Allowed Values</i>	<i>Supported Value(s)</i>
Features for scope: FCC_v2			
AC	The OUT is powered by or connected to AC Mains		
BT	EUT supports Bluetooth data rate of 1 Mbps with GFSK modulation in the band 2400 MHz - 2483.5 MHz		
EDR2	EUT supports Bluetooth using data rate of 2 Mbps with PI/4 DQPSK modulation in the band 2400 MHz - 2483.5 MHz		
EDR3	EUT supports Bluetooth using data rate of 3 Mbps with 8DPSK modulation in the band 2400 MHz - 2483.5 MHz		
Iant	Integral Antenna: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment		
TantC	temporary antenna connector, which may be only built-in for testing, designed as an example part of the equipment		
Wa1	EUT supports WLAN in mode a in the band 5150 MHz - 5250 MHz		
Wa2	EUT supports WLAN in mode a in the band 5250 MHz - 5350 MHz		
Wa3	EUT supports WLAN in mode a in the band 5470 MHz - 5725 MHz		
Wa4	EUT supports WLAN in mode a in the band 5725 MHz - 5825 MHz		
Wa5	EUT supports WLAN in mode a in the band 5725 MHz - 5850 MHz		
Wa6	EUT supports WLAN in mode a in the band 5745 MHz - 5805 MHz		
Wa7	EUT supports WLAN in mode a in the band 5180 MHz - 5240 MHz		
Wa8	EUT supports WLAN in mode a in the band 5260 MHz - 5320 MHz		
Wa9	EUT supports WLAN in mode a in the band 5500 MHz - 5600 MHz		
Wa10	EUT supports WLAN in mode a in the band 5650 MHz - 5700 MHz		
Wb	EUT supports WLAN in mode b in the band 2400 MHz - 2483.5 MHz		
Wg	EUT supports WLAN in mode g in the band 2400 MHz - 2483.5 MHz		
WLAN	EUT supports WLAN channels 2412 MHz - 2462 MHz.		

2.4 Auxiliary Equipment

<i>AE No.</i>	<i>Type Designation</i>	<i>Serial No.</i>	<i>HW Status</i>	<i>SW Status</i>	<i>Description</i>
AE 6					AC/DC Charging station for JOYA
AE 5	CHERRY RS 6000	G 0000273 2P28			Keyboard 1
AE 1	LG Flatron L1740BQ	509WANF1W607			TFT 1
AE 4	Logitech M-BB48	LZC90505478			Mouse
AE 2	Toshiba TECRA M9	87060248H			Laptop 1
AE 3	Toshiba PA3378E-3AC3	G71C0006R310			AC Adapter 1

2.5 Operating Mode(s)

<i>Ref.-No.</i>	<i>Description</i>
1	BT TX on 2402 MHz Packettype: DH1; WLAN 5180 MHz 6 Mbps

2.6 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

<i>Setup No.</i>	<i>List of OUT samples</i>		<i>List of auxiliary equipment</i>	
	<i>Sample No.</i>	<i>Sample Description</i>	<i>AE No.</i>	<i>AE Description</i>
A01_B01_C01_AC (Setup with AC/DC Charging station)				
	<i>Sample: a01</i>	Sample with int.Antenna	AE 6	AC/DC Charging station for JOYA
	<i>Sample: b01</i>	Sample with temp.ant.connector		
	<i>Sample: c01</i>	Sample with temp.ant.connector		
A01_PC (Computer peripheral setup)				
	<i>Sample: a01</i>	Sample with int.Antenna	AE 5	Keyboard 1
			AE 1	TFT 1
			AE 4	Mouse
			AE 2	Laptop 1
			AE 3	AC Adapter 1



3 Results

3.1 General

Documentation of tested devices:

Available at the test laboratory.

Interpretation of the test results:

The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation.

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

<i>Designation</i>	<i>Description</i>
FCC47CFRChIPART15bRADIO FREQUENCY DEVICES	Part 15, Subpart B - Unintentional Radiators

3.3 List of Test Specification

<i>Test Specification:</i>	FCC part 2 and 15
<i>Version</i>	10-1-10 Edition
<i>Title:</i>	PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES



3.4 Summary

<i>Test Case Identifier / Name Test (condition)</i>	<i>Result</i>	<i>Date of Test</i>	<i>Lab Ref.</i>	<i>Setup</i>
15b.1 Conducted Emissions (AC Power Line) §15.107				
15b.1; Mode = transmit	Passed	2011/02/17	Lab 1	A01_B01_C01_ AC
	operating mode: 1			
	Passed	2011/02/11	Lab 1	A01_PC
	operating mode: 1			
15b.2 Spurious Radiated Emissions §15.109				
15b.2; Mode = transmit	Passed	2011/02/18	Lab 2	A01_B01_C01_ AC
	operating mode: 1			
	Passed	2011/02/03	Lab 2	A01_PC
	operating mode: 1			



3.5 Detailed Results

3.5.1 15b.1 Conducted Emissions (AC Power Line) §15.107

Test1: 15b.1; Mode = transmit

<i>Result:</i>	Passed
<i>Setup No.:</i>	A01_PC
<i>Date of Test:</i>	2011/02/11 11:05
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

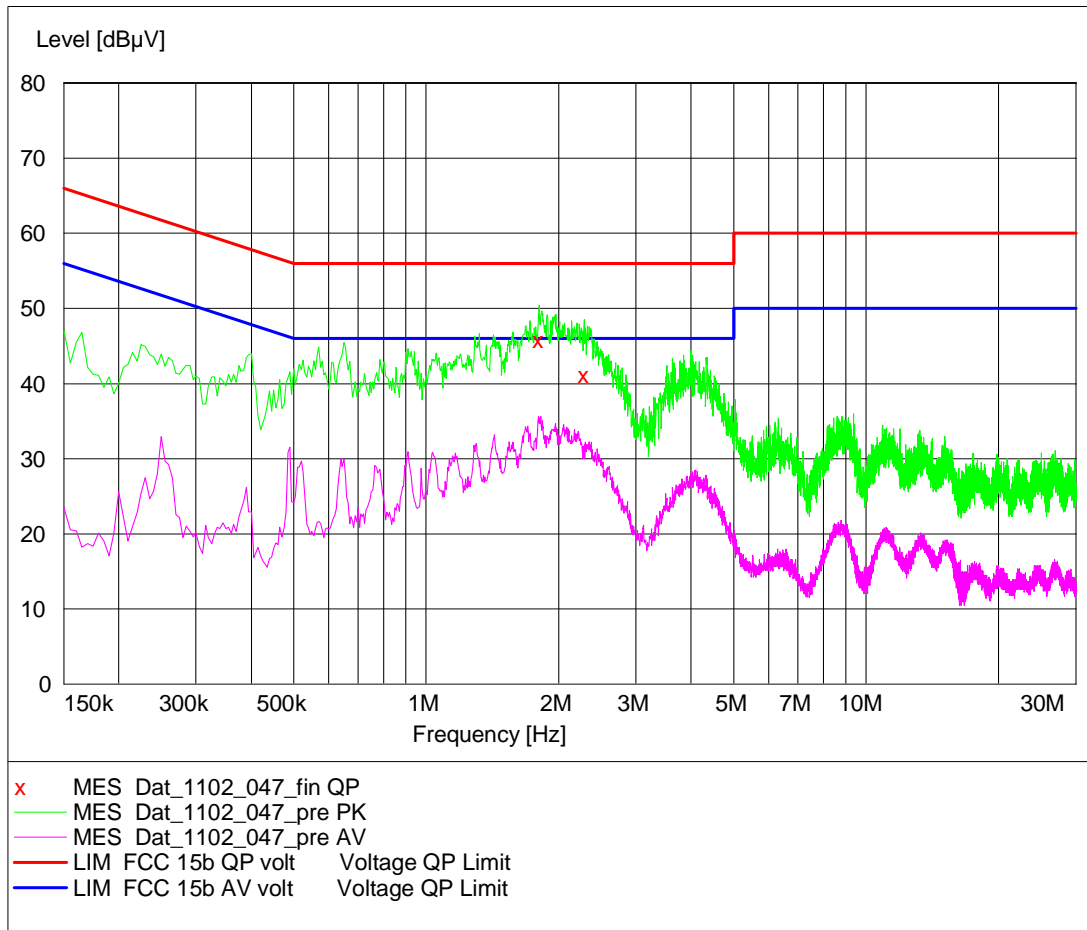
Detailed Results:

AC MAINS CONDUCTED

EUT: Joya (EX010a01) / 11.02.2011
 Manufacturer: Datalogic
 Operating Condition: BT TX on 2402 MHz Packettype: DH1; WLAN 5180 MHz 6 Mbps
 Test Site: 7 layers Ratingen
 Operator: Doe
 Test Specification: ANSI C63.4; FCC 15.107 / 15.207
 Comment:
 Start of Test: 11.02.2011 / 11:02:49

SCAN TABLE: "FCC Voltage"

Short Description:			FCC Voltage			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency	Width	MaxPeak	Average		
150.0 kHz	30.0 MHz	5.0 kHz		20.0 ms	9 kHz	ESH3-Z5



MEASUREMENT RESULT: "Dat_1102_047_fin QP"

11.02.2011 11:08

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
1.805000	45.80	10.1	56	10.2	N	GND
2.285000	41.10	10.0	56	14.9	N	GND



Reference: MDE_DATA1_1102_FCCb

acc. Title 47 CFR chapter I part 15 subpart B

Test1: 15b.1; Mode = transmit

<i>Result:</i>	Passed
<i>Setup No.:</i>	A01_B01_C01_AC
<i>Date of Test:</i>	2011/02/17 18:11
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

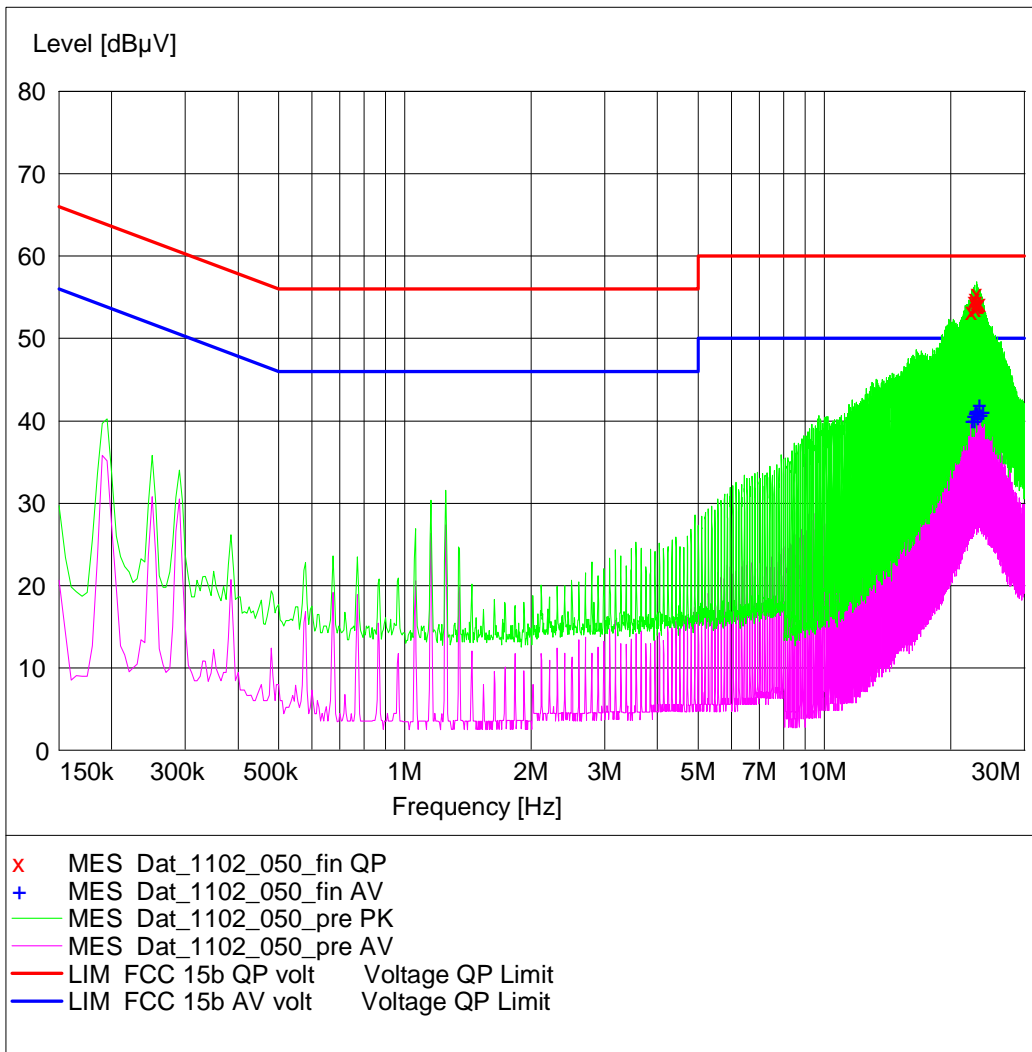
Detailed Results:

AC MAINS CONDUCTED

EUT: Joya (EX010a01/b01/c01) + AC/DC converter
 Manufacturer: Datalogic
 Operating Condition: BT TX on 2402 MHz DH1; WLAN 5180 MHz 6 Mbps
 Test Site: 7 layers Ratingen
 Operator: Gal
 Test Specification: ANSI C63.4; FCC 15.107 / 15.207
 Comment:
 Start of Test: 17.02.2011 / 17:55:14

SCAN TABLE: "FCC Voltage"

Short Description:	FCC Voltage	Meas. Time	IF Bandw.	Transducer
Start Frequency: 150.0 kHz	Detector: MaxPeak	20.0 ms	9 kHz	ESH3-Z5
Stop Frequency: 30.0 MHz	Average			
Step Width: 5.0 kHz				





MEASUREMENT RESULT: "Dat_1102_050_fin QP"

17.02.2011 18:00

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
22.410000	53.30	10.6	60	6.7	L1	FLO
22.700000	54.50	10.6	60	5.5	L1	FLO
22.795000	54.90	10.6	60	5.1	L1	GND
22.895000	53.70	10.6	60	6.3	L1	FLO
22.990000	54.10	10.6	60	5.9	L1	FLO
23.085000	55.50	10.6	60	4.5	L1	FLO
23.180000	54.50	10.6	60	5.5	L1	FLO
23.275000	54.10	10.6	60	5.9	L1	FLO
23.375000	54.20	10.6	60	5.8	L1	FLO
23.565000	54.30	10.6	60	5.7	L1	FLO

MEASUREMENT RESULT: "Dat_1102_050_fin AV"

17.02.2011 18:00

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
22.415000	40.10	10.6	50	9.9	N	FLO
22.610000	40.70	10.6	50	9.3	L1	GND
22.700000	40.20	10.6	50	9.8	N	FLO
22.800000	41.10	10.6	50	8.9	N	FLO
22.895000	41.40	10.6	50	8.6	N	GND
23.090000	41.10	10.6	50	8.9	N	FLO
23.180000	40.50	10.6	50	9.5	N	FLO
23.375000	42.10	10.6	50	7.9	L1	FLO
23.570000	40.80	10.6	50	9.2	N	GND
23.855000	41.20	10.6	50	8.8	L1	FLO



3.5.2 15b.2 Spurious Radiated Emissions §15.109

Test1: 15b.2; Mode = transmit

<i>Result:</i>	Passed
<i>Setup No.:</i>	A01_PC
<i>Date of Test:</i>	2011/02/03 17:24
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

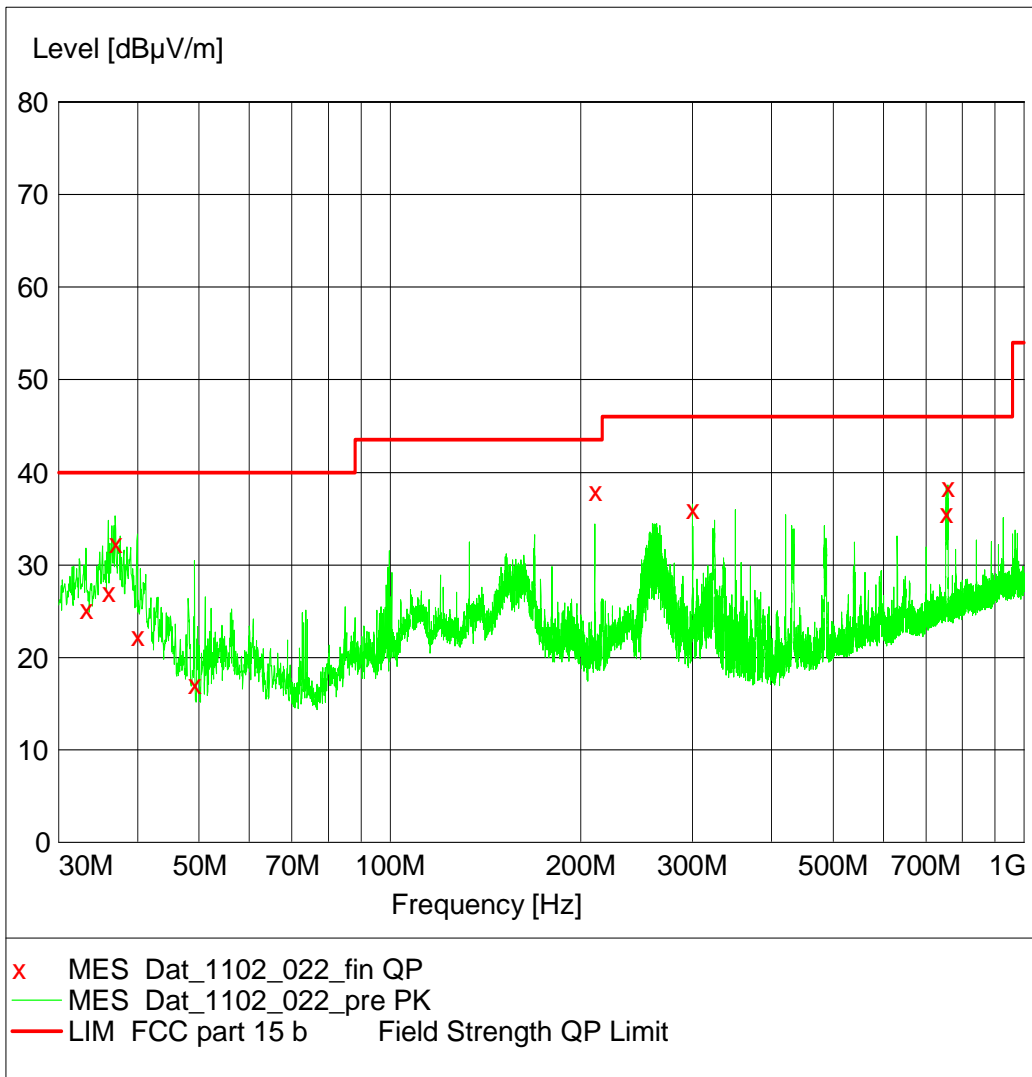
Detailed Results:

EMI RADIATED TEST

EUT: Joya (EX010a01) / 03.02.2011
 Manufacturer: Datalogic
 Operating Condition: BT TX on 2402 MHz Packettype: DH1; WLAN 5180 MHz 6 Mbps
 Test Site: 7 layers, Ratingen
 Operator: Doe
 Test Specification: FCC part 15 b
 Comment: Horizontal EUT position
 Start of Test: 03.02.2011 / 16:39:36

SCAN TABLE: "FCC part 15 b"

Short Description:	FCC part 15 b						
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer	
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	1.0 ms	120 kHz	HL562	





MEASUREMENT RESULT: "Dat_1102_022_fin QP"

03.02.2011 17:38

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
33.120000	25.20	18.9	40.0	14.8	100.0	248.00	VERTICAL
35.940000	27.10	17.2	40.0	12.9	110.0	264.00	VERTICAL
36.840000	32.40	16.7	40.0	7.6	100.0	272.00	VERTICAL
39.900000	22.30	15.0	40.0	17.7	102.0	157.00	VERTICAL
49.140000	17.20	9.4	40.0	22.8	100.0	202.00	VERTICAL
210.360000	38.00	9.3	43.5	5.5	152.0	50.00	HORIZONTAL
300.000000	36.00	13.0	46.0	10.0	125.0	14.00	HORIZONTAL
753.960000	35.60	22.1	46.0	10.4	104.0	202.00	VERTICAL
758.940000	38.40	22.1	46.0	7.6	106.0	202.00	VERTICAL

Test2: 15b.2; Mode = transmit

Result: Passed
Setup No.: A01_B01_C01_AC
Date of Test: 2011/02/18 12:40
Body: FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification: FCC part 2 and 15

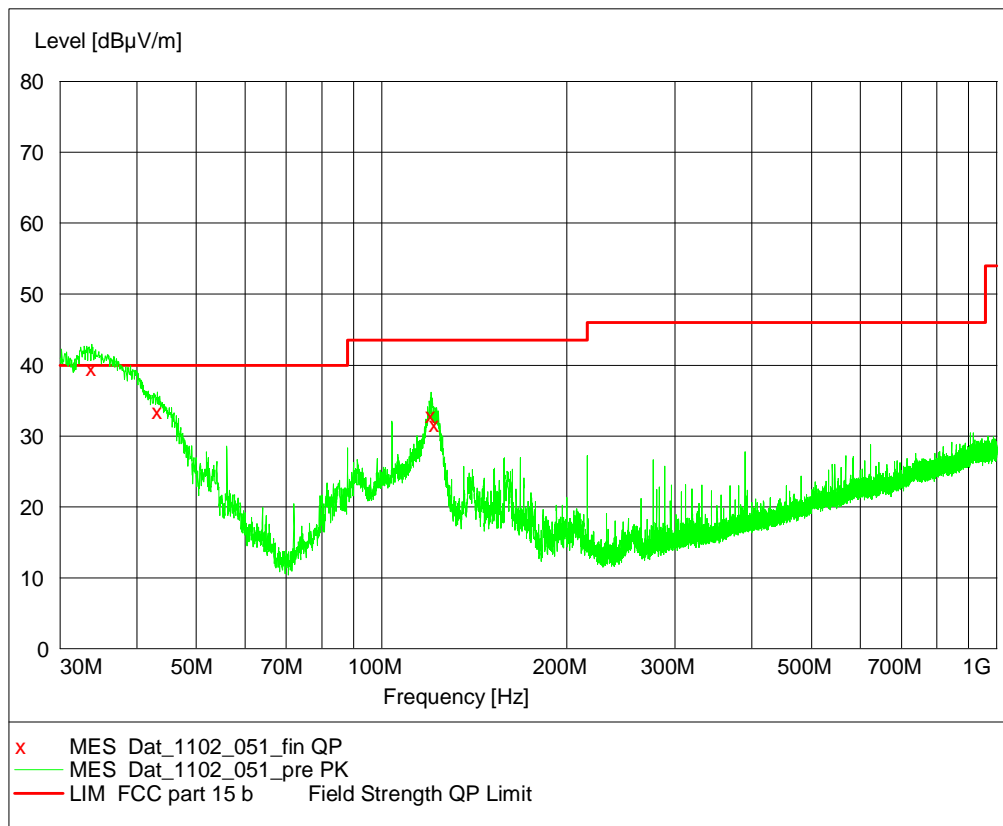
Detailed Results:

EMI RADIATED TEST

EUT: Joya (EX010a01/b01/c01) + AC/DC converter
 Manufacturer: Datalogic
 Operating Condition: BT TX on 2402 MHz DH1; WLAN 5180 MHz 6 Mbps
 Test Site: 7 layers, Ratingen
 Operator: Gal
 Test Specification: FCC part 15 b
 Comment: Horizontal EUT position
 Start of Test: 18.02.2011 / 09:04:38

SCAN TABLE: "FCC part 15 b"

Short Description:		FCC part 15 b				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	1.0 ms	120 kHz	HL562



MEASUREMENT RESULT: "Dat_1102_051_fin QP"

18.02.2011 10:03

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
33.780000	39.50	18.5	40.0	0.5	100.0	292.00	VERTICAL
43.200000	33.50	13.1	40.0	6.5	102.0	157.00	VERTICAL
120.300000	32.90	11.2	43.5	10.6	190.0	359.00	HORIZONTAL
122.220000	31.70	10.6	43.5	11.8	211.0	0.00	HORIZONTAL

4 Test Equipment Details

4.1 List of Used Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID:	Lab 2
Manufacturer:	Frankonia
Description:	Anechoic Chamber for radiated testing
Type:	10.58x6.38x6 m ³

Single Devices for Anechoic Chamber

Single Device Name	Type	Serial Number	Manufacturer
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m ³	none	Frankonia
	<i>Calibration Details</i>		<i>Last Execution Next Exec.</i>
	FCC listing 96716 3m Part15/18		2011/01/11 2014/01/10
	IC listing 3699A-1 3m		2011/02/07 2014/02/06
Controller Maturo	MCU	961208	Maturo GmbH
EMC camera	CE-CAM/1	-	CE-SYS
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1	-	Siemens&Matsushita
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita

Test Equipment Auxiliary Equipment for Conducted emissions

Lab ID:	Lab 1
Manufacturer:	Rohde & Schwarz GmbH & Co.KG
Description:	EMI Conducted Auxiliary Equipment

Single Devices for Auxiliary Equipment for Conducted emissions

Single Device Name	Type	Serial Number	Manufacturer
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber&Suhner
	<i>Calibration Details</i>		<i>Last Execution Next Exec.</i>
	Path Calibration		2010/11/06 2011/11/05
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz GmbH & Co. KG
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution Next Exec.</i>
	DKD calibration		2008/10/13 2011/10/12
	DKD calibration		2011/01/20 2013/01/19

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID: Lab 2
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	Type	Serial Number	Manufacturer
Antenna mast	AS 620 P	620/37	HD GmbH
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2008/10/27 2013/10/26
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01- 2+W38.01-2	Kabel Kusch
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02- 2+W38.02-2	Rosenberger Micro-Coax
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/04/16 2012/04/15
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/04/28 2012/04/27
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2010/11/06 2011/05/05

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/05/27 2012/05/26
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	DKD calibration		2008/10/07 2011/10/06
Network Analyzer	E5071B	MY42200813	Agilent
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2010/11/09 2011/11/09
Pyramidal Horn Antenna 26,5 GHz	3160-09	00083069	EMCO Elektronik GmbH
Pyramidal Horn Antenna 40 GHz	3160-10	00086675	EMCO Elektronik GmbH
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5-10kg/024/3790709	Maturo GmbH

Test Equipment Auxiliary Test Equipment

Lab ID:	Lab 2
Manufacturer:	see single devices
Description:	Single Devices for various Test Equipment
Type:	various
Serial Number:	none

Single Devices for Auxiliary Test Equipment

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>
AC Power Source	Chroma 6404	64040001304	Chroma ATE INC.
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2009/10/07 2011/10/06
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorenwerke GmbH
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG

Test Equipment Emission measurement devices

Lab ID: Lab 1, Lab 2
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Emission measurement devices

Single Device Name	Type	Serial Number	Manufacturer
Personal Computer	Dell	30304832059	Dell
Power Sensor	NRV-Z1	836219/005	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/10/20 2011/10/19
Powermeter	NRVS	836333/064	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2009/10/15 2011/10/14
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/12/03 2011/12/02

Test Equipment Shielded Room 02

Lab ID: Lab 1
Manufacturer: Frankonia
Description: Shielded Room for conducted testing
Type: 12 qm
Serial Number: none

4.2 Laboratory Environmental Conditions

Laboratory	Date	Temperature	Humidity	Air Pressure
Lab 1	2011/02/11	22 °C	40 %	1006 hPa
	2011/02/17	23 °C	36 %	1000 hPa
Lab 2	2011/02/03	25 °C	32 %	1020 hPa
	2011/02/18	24 °C	35 %	1002 hPa



5 Annex

5.1 Additional Information for Report

Test Description

Conducted emissions (AC power line)

Standard FCC Part 15 Subpart B

The test was performed according to: ANSI C 63.4, 2009

Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.

The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50 μ H || 50 Ohm Line Impedance Stabilization Network (LISN) which meets the requirements of ANSI C63.4-2009, Annex B, in the frequency range of the measurements. The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan

Intention of this step is, to determine the conducted EMI-profile of the EUT.

EMI receiver settings:

- Detector: Peak - Maxhold
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement

Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.

EMI receiver settings:

- Detector: Quasi-Peak
- IF - Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:

- 1) Neutral lead - reference ground (PE grounded)
- 2) Phase lead - reference ground (PE grounded)
- 3) Neutral lead - reference ground (PE floating)
- 4) Phase lead - reference ground (PE floating)

The highest value is reported.

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.107, Class B Limit

Frequency Range (MHz)	QP Limit (dB μ V)	AV Limit (dB μ V)
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50

FCC Part 15, Subpart B, §15.107, Class A Limit

Frequency Range (MHz)	QP Limit (dBµV)	AV Limit (dBµV)
0.15 - 0.5	79	66
0.5 - 30	73	60

Used conversion factor: Limit (dBµV) = 20 log (Limit (µV)/1µV).

NOTES:

A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.
The chosen operating mode is selected as representative mode to generate "worst-case" conditions, i.e. high power consumption.

Spurious radiated emissions

Standard FCC Part 15, Subpart B

The test was performed according to: ANSI C 63.4, 2009

Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.
The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.
The test was performed at the distance of 3 m between the EUT and the receiving antenna. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The radiated emissions measurements were made in a typical installation configuration. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition.

Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)

Intention of this step is, to determine the radiated EMI-profile of the EUT.

Settings for step 1:

- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: -180° to +180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2:

A further measurement will be performed on the frequencies determined in step 1. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

Settings for step 2:

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: -180° to +180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m

acc. Title 47 CFR chapter I part 15 subpart B

- Height variation step size: 0.5 m
 - Polarisation: horizontal + vertical
- After this step the EMI test system has determined the following values for each frequency (of step 1):
- Frequency
 - Azimuth value (of turntable)
 - Antenna height
- The last two values have now the following accuracy:
- Azimuth value (of turntable): 45°
 - Antenna height: 0.5 m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by +/- 22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by +/- 25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: -22.5° to +22.5° around the determined value
- Height variation range: -0.25 m to +0.25 m around the determined value

Step 4: Final measurement (with QP detector)

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

Measurement above 1 GHz:

The following modifications apply to the measurement procedure for the frequency range above 1 GHz: The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse-linear-distance-squared for the power density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.

Detector: Peak, Average (simultaneously)

RBW = VBW = 1 MHz; above 7 GHz 100 kHz

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits

Frequency Range (MHz): Class B Limit (dBµV/m)

Frequency Range (MHz)	Class B Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

Frequency Range (MHz) Class A Limit (dBµV/m) / @ 3m !

30 - 88	49.5
88 - 216	54.0
216 - 960	56.9
above 960	60.0

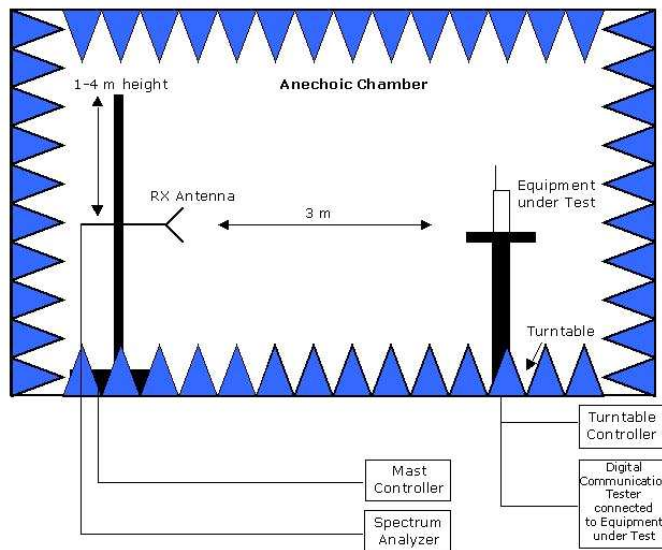
§15.35(b)

..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

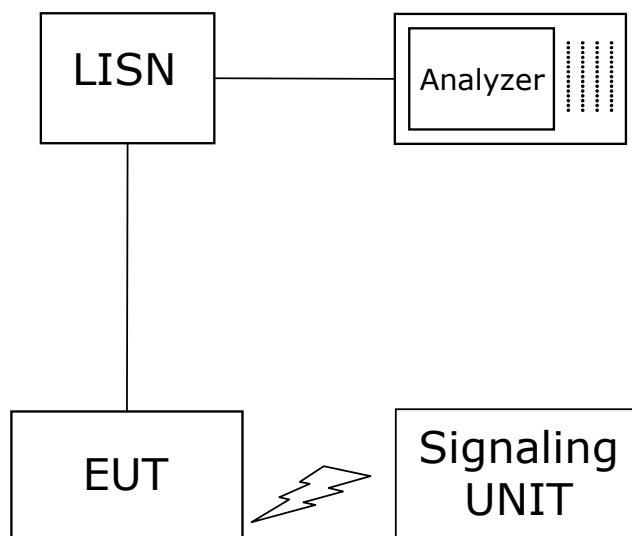
NOTE: A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

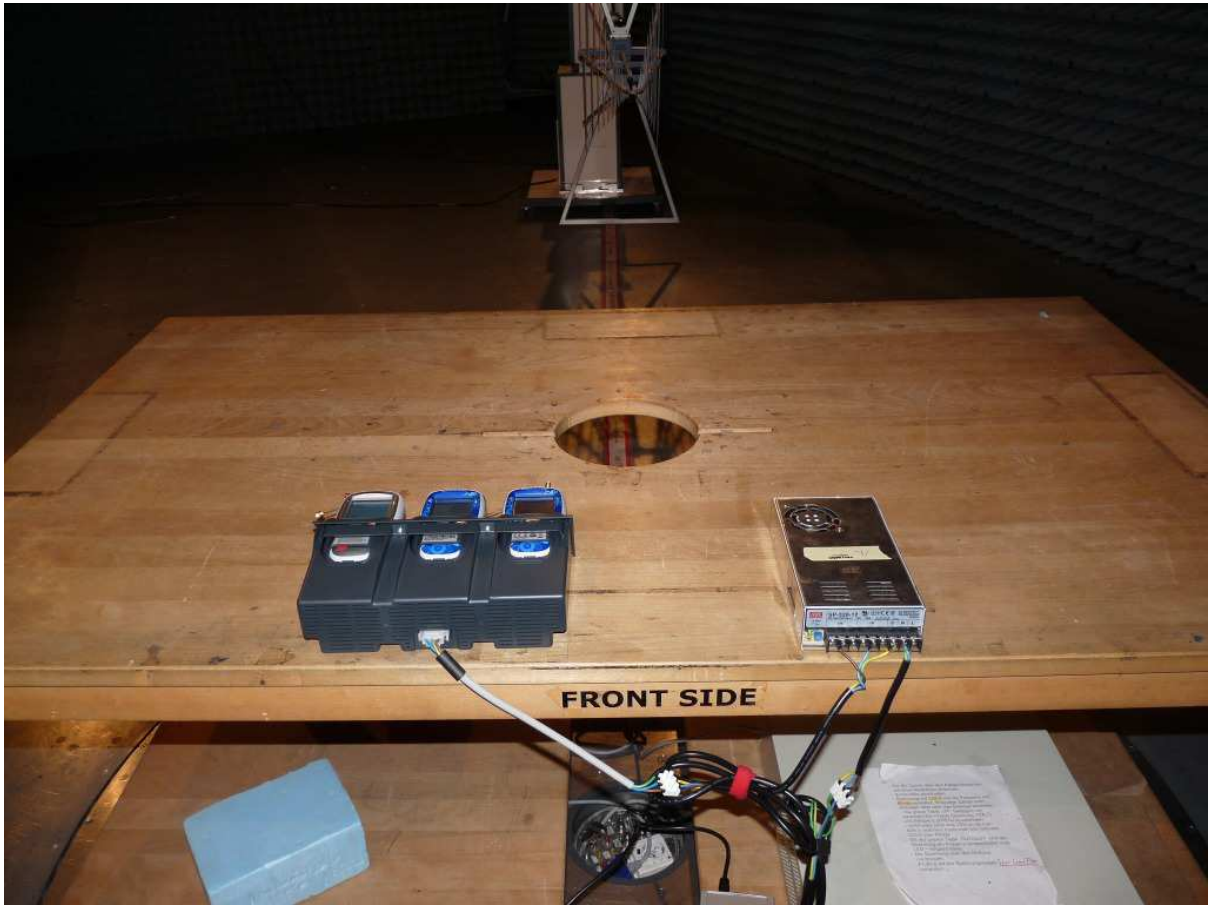
Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.



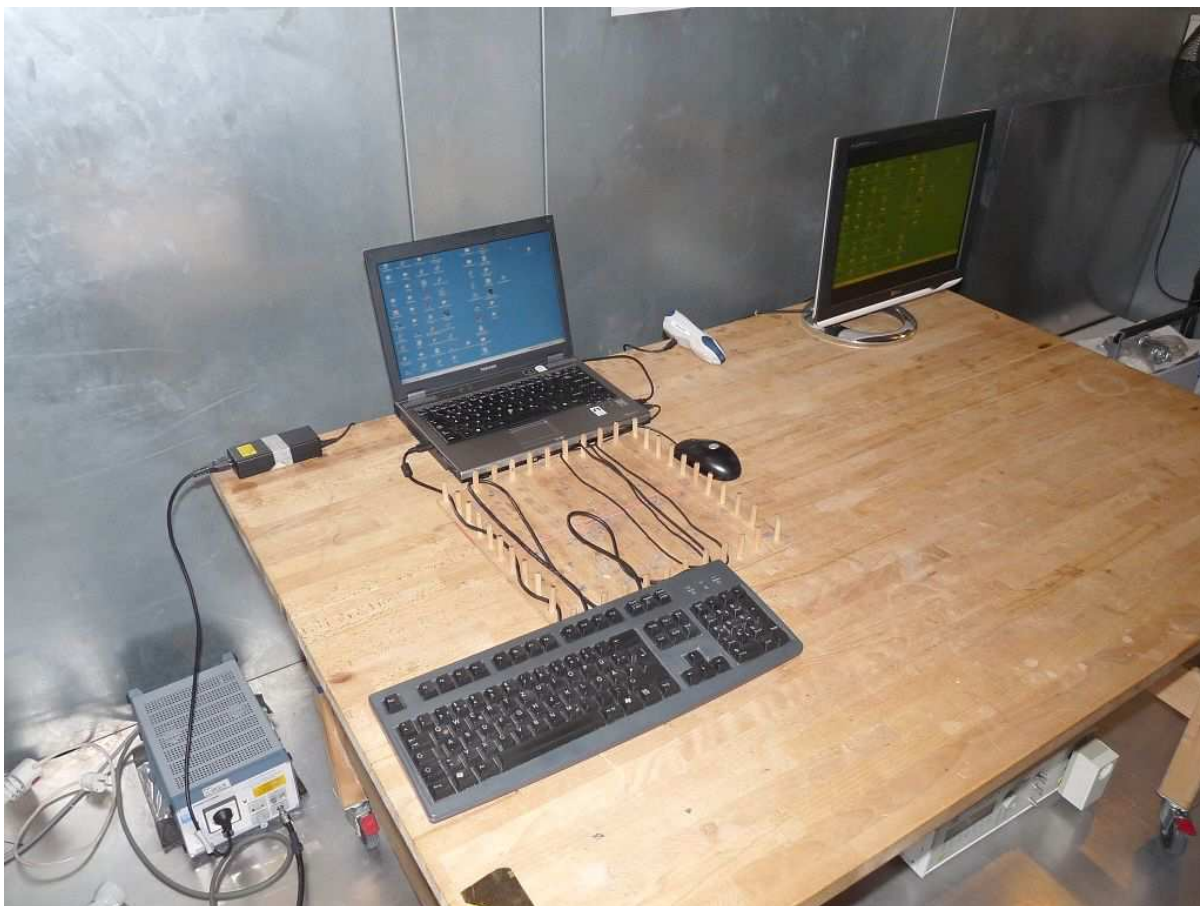
Setup in the shielded room for conducted measurements at AC mains port



Test Setup (radiated measurement)
Computer peripheral setup



Test Setup (radiated measurement)
Setup with AC/DC converter



Test Setup (conducted measurement)
Computer peripheral setup



Test Setup (conducted measurement)
Setup with AC/DC converter



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